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THE RURAL TRANSPORTATION RESEARCH PROJECT--
A SUMMARY REPORT

By

Thomas G. Myers
Michael J. Pesch
Donald W. Larson

A summary report prepared for the Ohio Department of Agriculture on a contract with the Department of Agricultural Economics and Rural Sociology at The Ohio State University and the Ohio Agricultural Research and Development Center.

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This is the final report on a series of studies analyzing transportation services for Ohio agriculture. The authors wish to thank Karlene Robison, Kathy Weaver, Janice Christensen and Debby Cesar for their most valuable assistance in the preparation of this report.

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Executive Summary

The condition of Ohio's rural transportation system has been given an increased amount of attention over the past several years. There has been concern as to whether or not the highway, waterway and railway systems that serve Ohio's huge agricultural industry will be able to maintain a satisfactory level of service in the future. This situation led to the initiation of the Rural Transportation Research Project, which was a two year study cosponsored by the Ohio Department of Agriculture and The Ohio State University Department of Agricultural Economics and Rural Sociology. The purpose of this report is to describe and summarize the recent research that has been conducted as a part of this project.

Agriculture, which comprises Ohio's largest industry, relies heavily on a sound transportation network in order to function properly and efficiently. This is demonstrated by the enormous volumes of farm inputs and agricultural commodities that are transported between supply centers, farm production sites and terminal markets each year. The three principal modes of transportation affecting Ohio's agricultural industries and communities are highway, waterway and rail. This report will, therefore, present the primary findings of the research project with one section pertaining to each of these three respective modes of transportation.

The Rural Transportation Research Project has devoted a great deal of attention to the study of Ohio's rural roads and bridges for several reasons. First of all, a sound highway system has proven to be essential in order to serve the many widely dispersed

agricultural production sites and rural communities in the state. Secondly, there is a large amount of evidence to indicate that the state's various highway maintenance departments have been unable to perform repairs at a rate adequate to keep pace with the bridge and roadway deterioration caused by increased roadway usage, aging and weather.

The Ohio highway system is made up of 110,846 miles of roadway and 37,529 bridges. The County Engineers Association of Ohio estimates that of the 25,029 bridges in the state that are maintained at least in part by county highway departments, nearly 18,000 are in need of either rehabilitation or replacement. They further estimate that the cost to repair these bridges is 2.2 billion dollars. In addition to this, the Ohio Department of Transportation (ODOT) rates 4,265 of the 11,634 bridges it maintains as only 80 percent sufficient. That is to say that serviceability has depreciated by at least 20 percent. ODOT estimates that the cost of replacing 606 of its most "critical-condition" bridges could easily cost in excess of $600 million over the next five years.

There are several reasons why a situation such as this has developed. The number of demands being placed on the state's highway network has increased dramatically over the past several decades. Not only have the total number of motor vehicle registrations more than doubled since 1950, but the sizes and weights of many commercial trucks and farm vehicles have risen as well. This becomes especially important when it is viewed in light of the fact that the General Accounting Office reports that one

80,000 pound tractor-trailer causes 9,600 times as much damage to a highway as one 4,000 pound automobile.

Inflation and decreased fuel consumption are also important factors that have contributed to the highway funding deficit. The cost of highway construction materials, many of which are petroleum derivatives, increased along with the price of crude oil. This, along with the fact that labor costs have also gone up sharply, has meant that many highway department budgets have simply not had enough funds to perform an adequate amount of repairs to the state's roads and bridges. The largest single source of revenue for Ohio's highway departments is the motor vehicle fuel tax. Even though the tax was recently increased from 7 to 11.7 cents per gallon, the increased popularity of fuel-efficient cars has caused an 8.3 percent reduction in the total gallons of fuel taxed in Ohio since 1978. Overall, this has resulted in a reduction in the nominal as well as inflation-adjusted levels of revenue that have been collected from this important source.

This report discusses five suggested solutions that could be employed to alleviate the highway funding deficit. The solutions that the authors feel should receive the most attention are to increase the axle-mile tax and the motor vehicle registration fees.

The funding of the waterway segments serving Ohio agriculture has also received a great deal of attention in recent years. The importance of this mode of transportation is evidenced by

the fact that there were 47 million bushels of grain shipped by barge from Cincinnati in 1980. This is in addition to the 182 million bushels of grain that were shipped from Ohio ports on Lake Erie in that same year.

Until recently, the Federal government had assumed the financial responsibility for the development and maintenance of the U.S. inland waterway system. The only exception to this has been the minimal lockage fees that have been collected for transit on the St. Lawrence Seaway System. The U.S. share of these fees for grain shipments amounts to only $.14 per metric ton or approximately 0.4 cents per bushel. However, this situation changed in 1978 with the passage of the Inland Waterway Revenue Act. The purpose of this legislation is to collect a tax on diesel fuel consumed by barge operators on the inland waterway system. The Act established a fuel tax of 4 cents per gallon beginning in October, 1980 and also specified incremental tax increases to 10 cents per gallon by 1985. In addition to this, the Reagan Administration is in favor of further legislation that would enact user charges substantial enough for the recovery of 100% of the inland waterway nagivation costs.

One of the essential items that must be considered before enacting a waterway user charge is to estimate the economic ramifications of such a proposal. Although this will obviously be determined by many variables, the consensus of the majority of the available literature on the subject indicates that in the long run, the majority of the economic burden of a waterway user

charge will be borne by the shipper. This means that for the transportation of grain and other agricultural commodities, the farmer will be forced to absorb the majority of the costs of this tax due to the fact that he will likely be receiving a lower average market price for his products. The actual amount of the economic burden will be determined in part by the competitive pricing actions of the railroads and barge operators who transport agricultural commodities. Assuming that the barge rates will increase when the user charge is enacted, railroads have a choice of either raising their rates along with the barge rates or else maintaining their rates at the same level and enjoying the benefits of increased market share. The higher the railroads raise their rates in response to a barge rate increase, the higher will be the overall economic load placed upon the farmer.

There have been several research studies conducted attempting to estimate the amount of decrease in grain prices that farmers will receive as a result of a waterway user charge. One of the more extensive studies was conducted by the U.S. Army Corps of Engineers and its results indicate that a segment-specific waterway user charge for the recovery of 100% of the navigation costs on the inland waterway system will add an additional 2.2 cents per bushel to the cost of transporting grain by barge from Cincinnati to Baton Rouge. The additional cost for this same shipment under a system-wide user charge is 5.3 cents per bushel. Furthermore, the Corps of Engineers indicates that a waterway user charge for the Ohio ports of Toledo and Huron will result

in an additional cost of 0.4 and 0.5 cents per bushel of grain transported from each respective port area.

The information presented in this report indicates that for the transportation of agricultural commodities, the majority of the costs of the implementation of a waterway user charge will be borne by the farmer in the long run. Due to the fact that a segment-specific waterway user charge appears to have the least financial impact on Ohio, the authors of this report feel that the implementation of this particular type of user charge will be the most advantageous for Ohio's farmers.

The final section of this report concerns the research that has been conducted concerning rail transportation in Ohio. This mode of transportation is important not only because of the large volumes of agricultural commodities that are shipped by rail each year, but also because the intermodal competitive actions and reactions of the railroad industry are an important factor in determining the barge and trucking rates affecting the movement of these commodities.

The recent passage of two items of legislation, the Northeast Rail Service Act of 1981 and the Staggers Act of 1980, has made it easier for railroad companies to change their rates and also abandon unprofitable branchlines. The fear that many country grain elevators would suffer financial hardships due to a loss of rail service prompted this research. Although there have been few, if any, instances of grain elevator closures caused solely by the abandonment of a rail branchline, this is an area of concern that should definitely receive continued attention in the future.

For more information concerning any of these three modes of transportation, the reader is asked to refer to the reports listed in Table 1 of this report.

The Rural Transportation Research Project--A Summary Report

Introduction

The purpose of this report is to describe and summarize the recent research that has been conducted as a part of the Rural Transportation Research Project for the Ohio Department of Agriculture. This project was a two year study that began on December 1, 1980 and extended until November 30, 1982. The funding for this project was made available through a grant from the Ohio Rural Rehabilitation Trust Fund as well as through the capital and physical resources of The Ohio State University Department of Agricultural Economics and Rural Sociology. The objectives of this project were to:

- Survey current transportation services related to the production and processing of agricultural comodities in the state of Ohio.
- Conduct an in-depth analysis of the current problems and policies affecting transportation services to determine potential economic impacts on agricultural producers and rural communities.
- Propose and analyze alternative solutions related to the transportation problems affecting Ohio's agricultural industry.

Seven reports were completed for this research project. The titles and dates of publication of these reports are listed in Table 1.

Further information concerning any or all of these reports may be obtained by contacting the Ohio Department of Agriculture in Columbus, Ohio or the Department of Agricultural Economics and Rural Sociology, The Ohio State University.

Table 1. List of Reports Completed as a Part of the Rural Transportation Research Project for the Ohio Department of Agriculture

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"Waterway Transportation for Ohio Agriculture," Pesch and Larson, ESO 856, April 14, 1981.

"Ohio Rural Road and Bridge Problems: Issues and Alternative Solutions," Pesch and Larson, ESO 857, August 17, 1981.

"Rail Transportation for Ohio Agriculture," Pesch and Larson, ESO 869, November 2, 1981.

"How Will Higher Transportation Costs, Regulatory Change and Economic Recession Affect Trucking Services for Ohio Agriculture?", Pesch and Larson, ESO 877, January 15, 1982.

"Alternative Highway Financing Policies: Implications for Ohio Agriculture," Pesch and Larson, ESO 924, April 9, 1982.

"The Status of the Ohio Highway System With Respect to the State's Agricultural Industry," Myers and Larson, ESO 948, August 23, 1982.

"The Waterway User Charge and Its Potential Impact on Ohio Grain Shipments," Myers and Larson, ESO 965, October 1, 1982.

Rural Roads and Bridges - The Highway Mode

Introduction

The Rural Transportation Research Project has placed a great deal of emphasis on the study of Ohio's rural roads and bridges for several reasons. First of all, a healthy highway system is essential to the efficient functioning of Ohio's agricultural industry. While it is true that rail and water shipments are also very important means of transporting agricultural products, the speed and versatility that is provided by a good highway system cannot be matched when it comes to serving the many widely dispersed agricultural production sites in the state. Secondly, there has been an increasing amount of attention over the past several years given to the funding and condition of this system due to the fact that maintenance programs have had difficulty in keeping pace with the highway deterioration caused by increased road usage, aging and weather.

The next section of this report will further discuss the importance of a sound highway system to the state's agricultural industry as well as presenting the current condition of Ohio's roads and bridges. This will be followed by a presentation of the entire state's highway taxation and revenue distribution system along with a list and explanation of five suggested solutions that are intended to help promote and facilitate the improvement of the rural road and bridge system in the state of Ohio.

Ohio Agriculture's Need for a Sound Highway System

Ohio ranks in the top ten nationally in the production of 36 agricultural products, attesting to its importance and versatility as an agricultural producer. The state has the third largest industrial payroll in the United States and yet still maintains agriculture as its leading industry.[1/] In order for this huge industry to function properly, an enormous amount of farm supplies, such as fertilizer and chemicals, need to be shipped into the state. In addition to this, the majority of Ohio's agricultural products need to be transported to either in-state or out-of-state destinations. Table 2 gives an indication of the immense volume of agricultural commodities that are transported by truck in Ohio each year.

In addition to those products mentioned in Table 2, the U.S. Department of Agriculture reported that 100 percent of Ohio's 157.8 million pound fresh fruit and vegetable crop arrived at the nation's principal markets by truck in 1980.[2/] There is also a tremendous amount of grain transported on the state's highway network. In 1977, Ohio elevators and grain processing firms received 114.4 million bushels of grain* from out-of-state origins. Of this amount, 95 percent was carried by truck from states such as Michigan, Indiana and Kentucky. There were also 368.4 million bushels of grain transported from Ohio farms to grain firms in 1977.[3/] Virtually all of this amount traveled on the state highway system.

*"Grain" as it is used here includes corn, soybeans, wheat and oats.

Table 2. Ohio Agricultural Commodities and Supplies That are Transported Primarily by Truck

	1975	1976	1977	1978	1979	1980	1981
				(million lbs.)			
Fertilizer	3474	3959	4097	3942	4458	4735	4849
Milk	4130	4315	4335	4165	4170	4220	4310
Cattle	852	866	920	864	599	687	645
Hogs	650	648	627	535	778	693	683
Sheep	28	25	34	24	25	22	20
Poultry	147	151	155	179	161	141	140
Eggs (mil.)	2090	1994	1941	2140	2235	2316	2415

Source: Ohio Agricultural Statistics

Table 3. Existing Mileage in the Ohio Highway System

Road Type	Mileage
Township roads	39,635 miles
County roads	29,803 miles
State highways	19,219 miles
Interstate system	1,535 miles
Village & City streets	20,654 miles
Total	110,846 miles

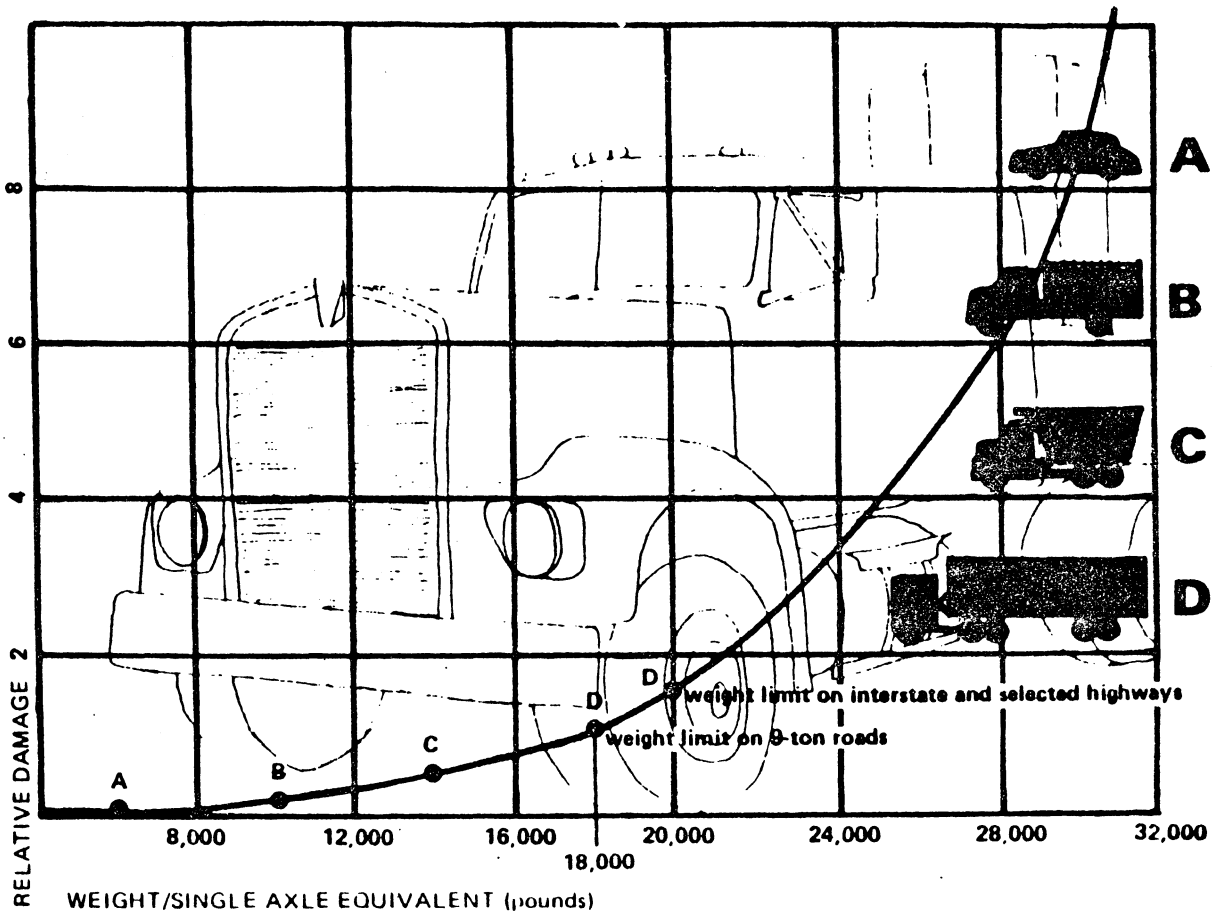
Source: Classification by Surface Type of Existing Mileage in Each County, Ohio Department of Transportation

ioration of the pavements (See Figure 1). Also, there are 2.5 times more trucks using the Interstate Highway System than were predicted when the highways were built.[5] Pavements on these highways were designed for a life span of 20 years before major work should be needed. However, with the larger volumes and heavier loaded trucks, major repair work is needed much sooner than originally anticipated. The first resurfacing of most Interstate highways is needed in eight years for blacktop pavements and 14 years for concrete pavements in order to maintain a satisfactory roadway condition.[6] The Ohio Department of Transportation (ODOT) estimates that 1,057 miles (out of 1,535 total) of Ohio's Interstate Highway System will need resurfacing over the next six years at a cost of $180,000 per mile.

Current Condition of Ohio's Bridges

In addition to the roadway mileage indicated in Table 3, the Ohio highway system also contains 37,529 bridges. Many of these bridges were originally built in the 1920s and 1930s. As mentioned previously, the sizes and weights of farm machinery and delivery trucks have increased dramatically since that time. While the maximum legal gross vehicle weight on any Ohio road is 40 tons, there are bridges on many county road systems which are rated to carry only 12-15 tons of total weight per vehicle. Some bridges have ratings as low as 5-6 tons. Bridges which have restricted ratings are posted and vehicles are required to either reduce their loads or detour around the bridge.

Figure 1: Damage Level Escalation Due to Added Vehicle Weight Per Axle



Source: Minnesota Department of Highways, Axle Load: Effects on Highway, p.2.

ODOT Maintained Bridges

The Ohio Department of Transportation is responsible for the maintenance of 11,634 of the 37,529 bridges in the state. ODOT rates 4,265 or one third of the bridges it maintains as only 80 percent sufficient. That is to say, serviceability has depreciated by at least 20 percent. ODOT reports that 605 of its bridges have a sufficiency rating of less than 50 percent and need immediate replacement. It is estimated that the cost of replacing these 605 "critical-condition" bridges could easily cost in excess of $600 million over the next five years. 7/ Given expected ODOT bridge funding of only $250 million for that period, most of the replacements will simply have to wait. This is a problem that can be expected to worsen in the near future due to the fact that many of the ODOT-maintained highway bridges are nearing the projected end of their useful life.

County Maintained Bridges

The County Engineers Association of Ohio has conducted an extensive inventory of the bridges in the state that are maintained totally or in part by the county highway departments. These bridges were rated by degree of sufficiency. The sufficiency rating system is based on nationally accepted standards established by the Federal Highway Administration and the American Association of State Highway and Transportation Officials. Every bridge's serviceability is expressed as a percentage between zero and 100. The ratings are calculated according to the adequacy of each bridge's roadway width, safe load-carrying

capacity, vertical and horizontal clearance and the ability to handle current traffic patterns. A summary of the inventory is given in Table 4.

Table 4 indicates that 17,914 of the 25,029 county-maintained bridges in Ohio are in need of either replacement or rehabilitation. Those bridges that are itemized in the table under the heading of "Not Reported" reflect an estimate by the County Engineers Association of the condition of the 5,000 bridges in the state that were not originally included in the inventory.

This inventory estimates that the total cost of replacing or rehabilitating the nearly 18,000 deficient county bridges in Ohio is 2.2 billion dollars. This huge "repair bill" seems even larger when it is realized that the cumulative total revenue for all of Ohio's county municipal and township highway departments was approximately $370 million in 1981. The huge difference between these totals illustrates the improbability of a significant portion of these repairs being completed under the current funding arrangements.

Highway Tax Revenues and Distribution

The majority of the funds for the financing of Ohio's highway system come from the following four sources:

1. Motor Vehicle Fuel Tax
2. Axle Mile Tax
3. Registration and Licensing Fees
4. Highway Patrol Fines

Table 4. Summary of County Bridge Inventory Conducted by the County Engineers Association of Ohio, May, 1981

Sufficiency Rating	Replacement	Rehabilitation
Reported (0% - 49.9%)	5,482	
Not Reported (0% - 49.9%)	1,100	
Reported (50% - 80%)		9,432
Not Reported (50% - 80%)		1,900
TOTALS BY CATEGORY	6,582 (22%)	11,332 (38%)
TOTAL DEFICIENT BRIDGES	17,914	
TOTAL COUNTY BRIDGES	25,029	

Source: Report on County Bridges, County Engineers Association of Ohio.

These charges, as well as their distribution structure, are stipulated by the Ohio Constitution. Each of the four revenue sources will be discussed separately.

Motor Vehicle Fuel Tax

The motor vehicle fuel tax, currently totaling 11.7 cents per gallon, is comprised of five separate tax funds. Each fund has its own specific method of distribution of revenue; however, for the sake of brevity the distribution method has been summarized as follows.

The first 0.5 percent of the total fuel tax collected is transferred to the Waterways Safety Fund. The remainder is distributed with approximately 75 percent allocated to state (ODOT) highway programs and 25 percent going to local (counties, municipalities, and townships) highway programs.

Axle-Mile Tax

The axle-mile tax is levied on commercial vehicles in relation to the number of axles they use in operation and the number of miles they are driven over public highways in Ohio. This tax was enacted in 1953 and is intended primarily for highway bond retirement. The highway use tax rates range from one-half cent per mile to two and one-half cents per mile. The rates have not changed since 1953.

As in the past years, the majority of the axle-mile tax revenue in fiscal year 1981 was generated by those vehicles in the two-cents-per-mile bracket. This bracket includes the conventional five axle semi. An indication of the increase in the weight of

commercial vehicles in Ohio can be seen by comparing the axle-mile tax revenues of 1965 and 1981 shown in Table 5. Not only did the total amount of tax increase, but the proportion of the tax levied against heavier vehicles also increased. This shows that heavy trucks are placing increased demands on the state's roadways. This point will be discussed in greater detail in a later section of this report.

Because it would be infeasible for the Department of Taxation to monitor the number of miles driven by each commercial vehicle in Ohio, the reporting of the axle-mile tax is voluntary. This in turn raises the question as to whether or not the correct amount of tax is being collected. Sources at the Department of Taxation indicated that they felt that the amount of axle-mile tax revenue that goes unreported each year is probably only about 10% of the total taxable amount. However, recent information that has been collected by ODOT's Bureau of Technical Services indicates that possibly only as little as 60 to 70% of the total amount of axle-mile tax due to the state is reported each year.

Registration and Licensing Fees

Operator's license and chauffeur's license fees are collected annually. This revenue, approximately $10 million, is allocated to the Department of Highway Safety for the Highway Safety Fund (30 percent) and the Driver Education Fund (70 percent).

Motor vehicle registration fees plus 50 cents registrar's fees are also collected annually. After administrative expenses, all of this revenue goes to county, township or municipal highway

Table 5. Axle-Mile Tax Revenue in Ohio in 1965 and 1981

Rate Per Mile	F. Y. 1965 $ Collected	F. Y. 1965 Percent of Total	F. Y. 1981 $ Collected	F. Y. 1981 Percent of Total
0.5 cents	$ 550,949	2.4	$ 1,039,045	2.2
1.0 cents	1,898,292	8.4	780,744	1.6
1.5 cents	8,307,189	36.8	3,626,224	7.5
2.0 cents	10,711,300	47.4	40,237,928	83.5
2.5 cents	1,137,649	5.0	2,493,270	5.2
Total	22,605,379	100.0	48,177,211	100.0

Source: 1965 and 1981 Annual Report, Ohio Department of Taxation.

departments. A flat fee is used for automobiles ($20.000), transit buses ($12.00), motorcycles ($10.00), house and travel vehicles ($35.00), and non-commercial vehicles with a capacity of 3/4 ton or less ($35.00). Fees for other vehicles such as commercial cars and trucks, buses (nontransit) and farm vehicles are based on weight with a minimum fee. The fees for these latter three types of vehicles are given specifically in Table 6.

Counties, and municipalities within counties, may also levy an additional $5.00 vehicle license tax. Forty-one counties and 125 municipalities currently impose this tax. All registration fees are consitutionally earmarked for highway purposes. After any bond retirement obligations and administrative expenses are met, the remaining revenues are distributed as follows:

34% to municipality or county of registration;

47% to county in which vehicle owner resides;

9% to counties in the ratio of the number of miles of county roads to the state total;

5% to townships in the ratio of the number of miles of township roads to the state total;

5% divided equally among the counties.

The first motor vehicle registration fee in Ohio was adopted in 1906. The charge was $5.00 and it covered all gasoline and steam motor vehicles. The passenger car registration fee was increased from $5.00 to $10.00 in 1948. It remained at this level until 1980 when it increased to $20.00.

A separate graduated rate schedule for commercial vehicles was added in 1925. This fee for commercial vehicles was increased

Table 6: Motor Vehicle Registration Graduated Rate Schedule for Commercial Trucks, Farm Trucks and Motor Buses

Type of Vehicle		Vehicle Registration Fee
Commercial Trucks, tractors, semi-trailers, trailers		$15.00 plus:
	First 2,000 lbs.	$ .85 per 100 lbs.
	2,001 - 3,000 lbs.	$1.40 per 100 lbs.
	3,001 - 4,000 lbs.	$1.90 per 100 lbs.
	4,001 - 5,000 lbs.	$2.20 per 100 lbs.
	5,001 - 6,000 lbs.	$2.40 per 100 lbs.
	6,001 - 10,000 lbs.	$2.80 per 100 lbs.
	10,001 - 12,000 lbs.	$3.00 per 100 lbs.
	Over 12,000 lbs.	$3.25 per 100 lbs.
Farm trucks		$5.00 plus:
	First 3,000 lbs.	$ .50 per 100 lbs.
	3,001 - 4,000 lbs.	$ .70 per 100 lbs.
	4,001 - 6,000 lbs.	$ .90 per 100 lbs.
	6,001 - 10,000 lbs.	$2.00 per 100 lbs.
	Over 10,000 lbs.	$2.25 per 100 lbs.
Motor buses	First 2,000 lbs.	$ .85 per 100 lbs.
	2,001 - 3,000 lbs.	$1.30 per 100 lbs.
	3,001 - 4,000 lbs.	$1.80 per 100 lbs.
	4,001 - 6,000 lbs.	$2.00 per 100 lbs.
	6,001 - 10,000 lbs.	$2.40 per 100 lbs.
	Over 10,000 lbs.	$2.75 per 100 lbs.

Source: Ohio's Taxes, Ohio Department of Taxation

in 1932 and once again in 1951. In addition to this, a separate graduated rate schedule was enacted in 1937 for farm trucks (See Table 6). Both of these latter registration fees were increased in 1980 when the fee for commercial trucks was increased by $15.00 while the fee for farm trucks was increased by $5.00.

As will be mentioned further in a later section of this report, inflation and increased highway usage have added to the burden being placed on the state's various highway maintenance departments. Table 7 shows the number of vehicles and the amount of registration fees collected for selected classes of vehicles in Ohio since 1950. The last year for which this information is currently available is 1978.

Table 8 shows motor vehicle registration fees for selected classes of vehicles for the years 1951, 1960, 1970 and 1980. These figures have been adjusted for inflation according to the Federal Highway Administration's construction cost index. As can be seen from this table, even though all three of these fees were increased in 1980, the actual spending power being provided by these registration fees has decreased dramatically since 1951.

Even though a registration fee may not be the most equitable means of collecting highway taxes, due mainly to the fact that the current fee does not fully take into account the wide range of miles traveled by individual vehicles, an increase in the vehicle registration fee may need to be considered in order to compensate for the effects of inflation. The benefits and disadvantages of such an increase definitely require a great deal of consideration before such an action should be taken.

Table 7: Number of Vehicles and Amount of Registration Fees Collected for Selected Classes of Vehicles in Ohio, 1950-1978[a/]

	Passenger Cars	Non-Farm Trucks	Farm Trucks	All Vehicles
		- - - Thousands - - -		
1950	$23,091 (2,437)	$15,528 (264)	$1,602 (72)	$46,308 (3,033)
1955	$29,546 (3,108)	$25,500 (321)	$1,908 (76)	$66,175 (3,798)
1960	$34,686 (3,618)	$29,620 (343)	$2,060 (77)	$77,427 (4,392
1965	$41,793 (4,405)	$33,330 (361)	$3,307 (132)	$91,957 (5,347)
1970	$49,660 (5,201)	$43,441 (459)	$4,376 (168)	$133,851 (6,439)
1975	$57,841 (5,975)	$57,030 (607)	$6,691 (244)	$166,093 (7,684)
1978	$62,613 (6,492)	$71,964 (789)	$2,776* (41)	$189,121 (8,536)

*Many farm trucks (those with a capacity of 3/4 tons or less) were reclassified as non-commercial vehicles in 1978.

[a/]The number in parentheses is the number of vehicles.

Source: Ohio Bureau of Motor Vehicles

Table 8: Motor Vehicle Registration Fees for Passenger Cars, Commerical Trucks (80,000 lbs.), and Farm Trucks (80,000 lbs.) and These Respective Amounts Adjusted for Inflation According to the Federal Highway Administration Construction Cost Index

Vehicle Class	1951	1960	1970	1980
Passenger Car	$10.00	$10.00	$10.00	$20.00
Inflation-Adjusted to 1977 dollars	$26.46	$27.02	$17.24	$12.27
Commercial Car of 80,000 lbs.	$2,478.00	$2,478.00	$2,478.00	$2,493.00
Inflation-Adjusted to 1977 dollars	$6,555.56	$6,697.30	$4,272.41	$1,529.45
Farm Truck of 80,000 lbs.	$1,695.00	$6,695.00	$1,695.00	$1,700.00
Inflation-Adjusted to 1977 dollars	$4,484.13	$4,581.08	$2,922.41	$1,042.94

Source: Ohio Bureau of Motor Vehicles and "Price Trends for Federal-Aid Highway Construction," Federal Highway Administration.

Highway Patrol Fines

Ohio Highway Patrol fines collected from citations are allocated 45 percent to Department of Transportation highway maintenance and repair. Fifty-five percent goes to the county or municipality in which the fine was assessed for the general fund or road and street repair.

Issues Concerning Ohio's Highway Transportation System

Highway Repair and Inflation

According to a 1977 General Accounting Office report, high ways are deteriorating at a 50 percent faster rate than they are being repaired.[8/] One of the reasons that highway maintenance departments have not had the necessary funding to perform needed repair work is inflation. The cost of essential highway construction materials increased by 276 percent between 1965 and 1981. This is according to the United States Department of Transportation construction cost index.

Figures 2, 3 and 4 show the amount of revenue collected from the motor vehicle fuel tax, motor vehicle registration fees and the axle mile tax respectively in the last 30 years. Each graph shows the nominal amount of revenue as well as correcting these totals for inflation according to the construction cost index. As can be seen from the graphs, the inflation adjusted amount of highway revenue being collected is less today than it was in the 1950s.

Equity of Present Highway Revenue Sources

A very important issue pertaining to highway transportation is that of how much revenue each type of vehicle should be re-

Figure 2. Nominal and Deflated Values of Ohio Motor Vehicle Fuel Tax Collection, 1954-1981

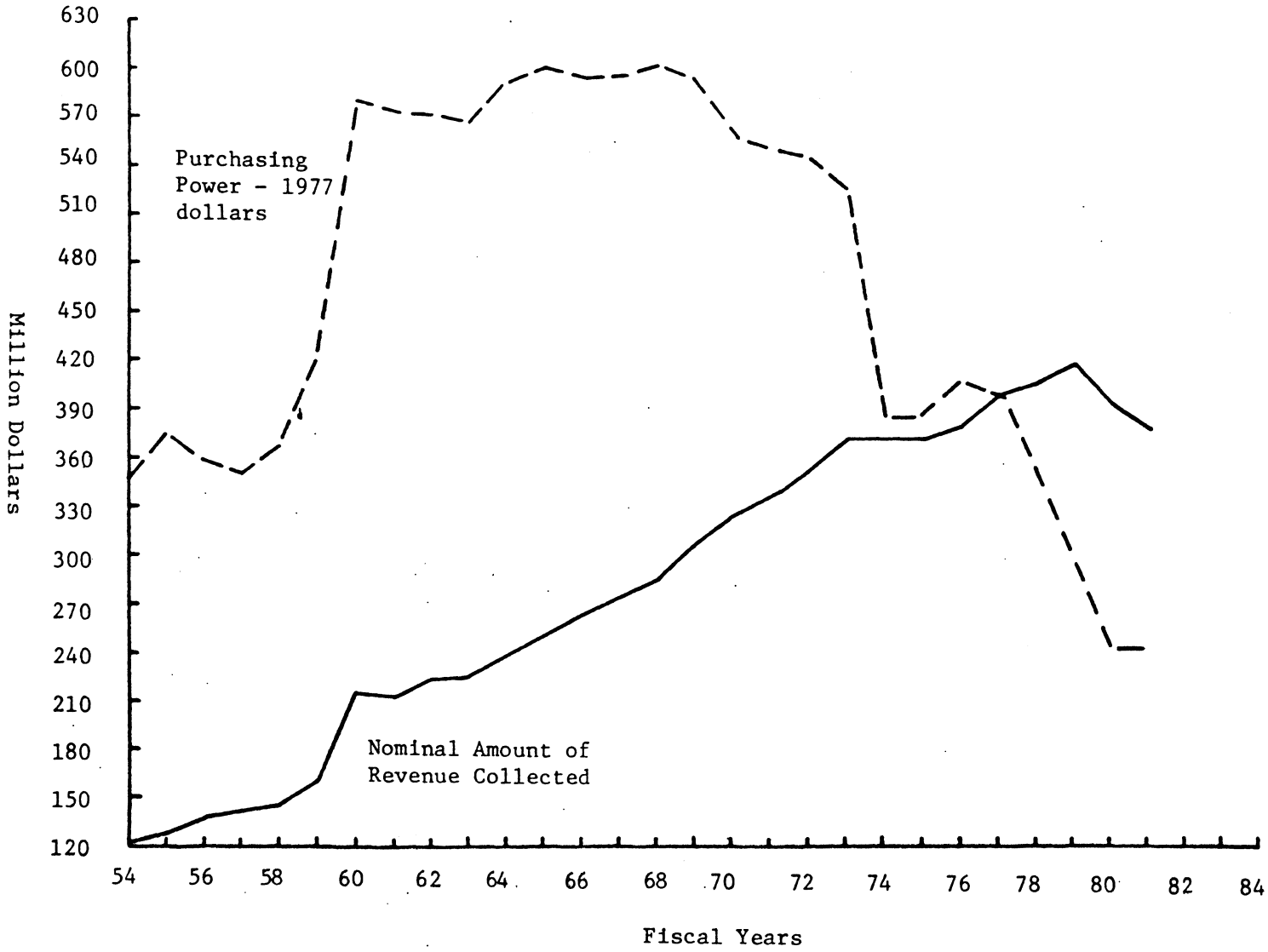


Figure 3. Nominal and Deflated Values of Ohio Motor Vehicle Registration Fees, 1950-1980

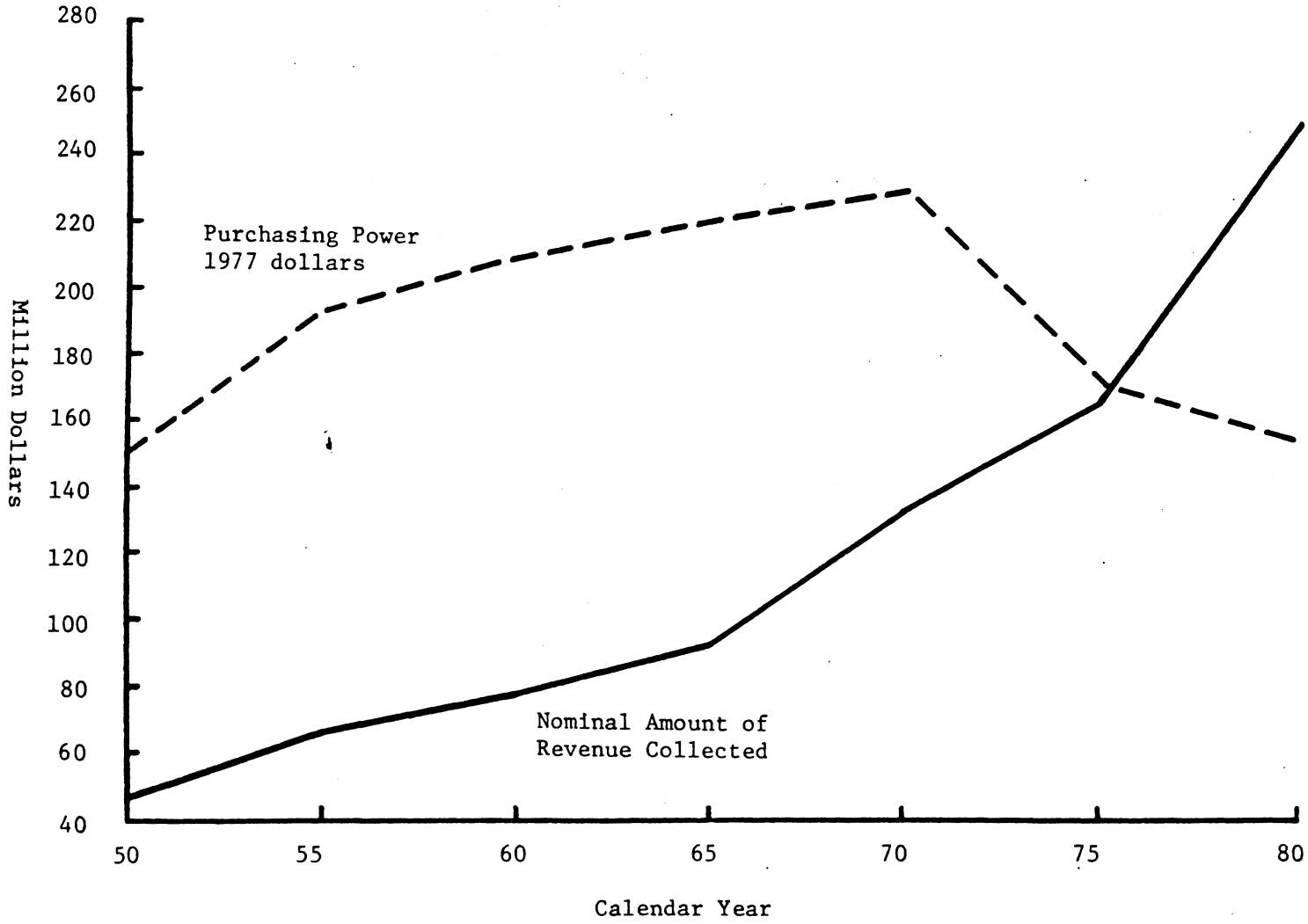
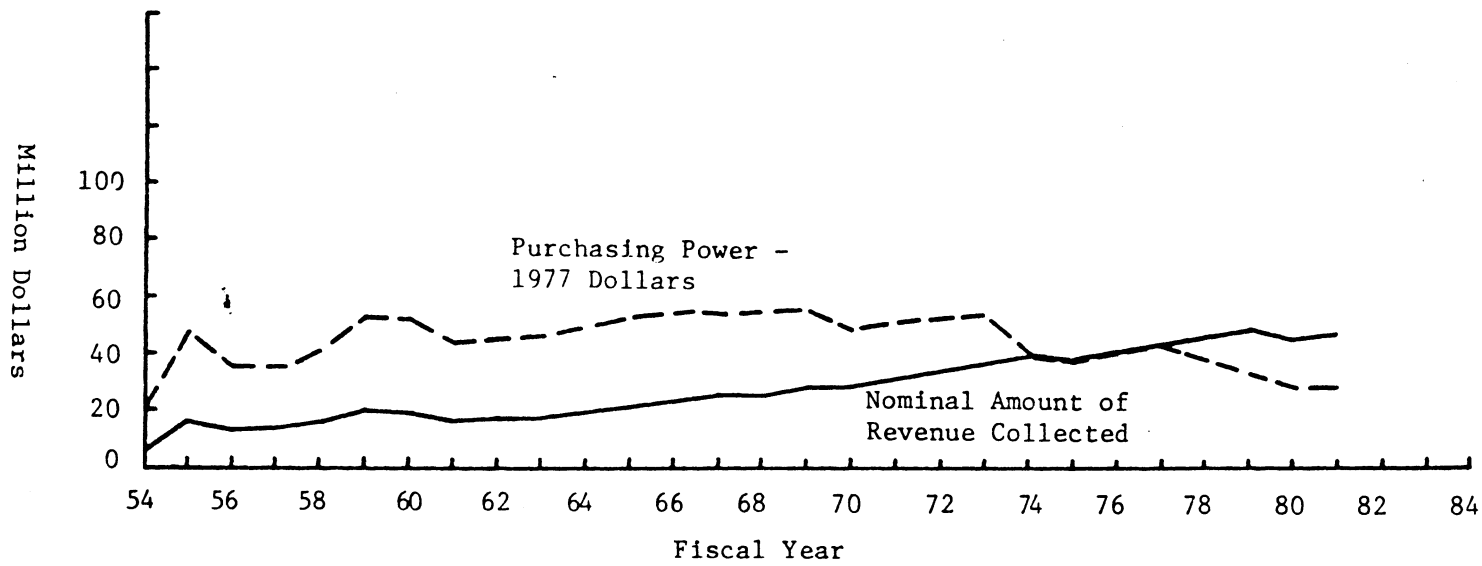


Figure 4. Nominal and Deflated Value of Ohio Axle-Mile Tax Collections, 1954-1981



quired to pay. There is much controversy surrounding the issue of vehicle weights and related highway damages. Trucking organizations attempt to downplay the amount of damage that heavy vehicles inflict on roadways and bridges. However, there is a growing amount of evidence to the contrary.

The Ohio Revised Code has changed very little since 1952 concerning the legal weight limits for highway vehicles. The maximum weight per axle was set in 1953 at 19,000 pounds. This was increased in 1975 to 20,000 pounds per axle with a maximum allowable vehicle weight of 80,000 pounds. However, as was demonstrated by Table 5, the frequency of heavier vehicles travel on the state's highways has risen sharply since 1965.

A 1979 General Accounting Office report states that one 80,000 pound five-axle tractor-trailer has the same impact on an interstate highway as at least 9,600 automobiles.[9/] The amount of damage also increases exponentially as the weight limits are increased (See Figure 1). Furthermore, national statistics show that about 22 percent of the loaded tractor-trailers exceed state weight limits.[10/] This problem is especially serious when heavy vehicles travel on rural roads and bridges.

The GAO report states that various farm products including grain, produce, meat and milk are often shipped in overweight trucks. Their review of an Ohio grain firm showed that during a 4-week period, 60 percent of the incoming trucks exceeded the 80,000 pound gross weight limit. The average overload was 5,600 pounds, with one tractor-trailer being 14,300 pounds over the gross weight limit.

Current Ohio weight enforcement efforts are apparently insufficient to prevent overweight trucking. This is hurting our state's highway system in two ways. First of all, revenue is lost due to the lack of citations. (ODOT states that weigh stations on the Ohio interstate system have a citation rate of less than 1 percent. This low rate is due primarily to the fact that truckers are almost always aware of when and where weigh stations are in operation.) The second, and most important, effect is the damage caused by the overweight vehicles.

Uniformity of State Weight Limits

The nation's trucking industry has shown a considerable amount of concern over the fact that the size and weight limits for commercial vehicles vary in each state. The truckers claim that this hinders their economic efficiency. This is especially a problem with long distance east-west hauls. For example, most states (including Ohio) have set the maximum allowable gross vehicle weight limit at or near 80,000 pounds. However, three states have a weight limit of only 73,280 pounds. These three states are Illinois, Missouri and Arkansas. Their respective locations form a "barrier" that prohibits the long distance movement of 80,000 pound loads over most east-west routes in the country.

Another similar problem occurs between Ohio and Michigan. The latter state allows gross vehicle weights of up to 148,000 pounds. A grain shipper may often be faced with the situation

in which he or she has transported a load of grain 100 miles or more through Michigan but can not legally deliver the load to one of the several grain terminals at Toledo located only 6-8 miles over the Ohio border. This hinders the Port of Toledo's ability to receive grain from Michigan for subsequent export.

While this report is not suggesting that states should necessarily increase their maximum allowable weight limits, an increased amount of uniformity in this area would certainly simplify and hopefully increase the overall efficiency of the trucking industry.

The above sections of this report have presented the current situation and discussed the problems surrounding Ohio's roads and bridges. The remainder of this section will discuss possible alternative solutions that may be used to correct the undesireable situations that have been identified.

Suggested Solutions

The complexity of the highway funding issue will likely require that more than one step will be needed in order to alleviate the funding deficit and any related inequities. For this reason it should be kept in mind that a combination of several of these alternative solutions may prove to be the best possible course of action. The following solutions have been ranked in accordance with their perceived feasibility and importance as viable alternatives; however, for a more complete and detailed list of alternative solutions, the reader is asked to refer to

an earlier report that was completed as a part of this research project. The titled of that report is "The Status of the Ohio Highway System With Respect to the State's Agricultural Industry," ESO 948, August 23, 1982.

1. Increase and Revise the Axle-Mile Tax Structure

Currently available information tends to support the claim that heavy trucks are not paying an amount of revenue equal to the costs generated by their use. While heavy trucks are traveling an increased number of miles in the state, Figure 4 shows that they are paying a decreased amount of tax (after correcting for inflation). This evidence leads to the conclusion that an overall increase in the axle-mile tax would be an appropriate measure in order to collect funds from the vehicles that are causing a majority of the highway resurfacing costs.

Sources at the Ohio Department of Transportation also point out that the present structure of the axle-mile tax may be inadequate. The reason for this is that as the amount of weight being placed on each axle goes up, the amount of damage caused to the roadway surface increases exponentially. These sources indicated that they do not feel that the current axle-mile tax structure, which basically specifies a 0.5 cent per mile increase for each additional axle per vehicle, sufficiently compensates for the increased damage caused by those vehicles in the "heavier" weight classes. A revision could be designed so as to assess a greater proportion of the total tax against those vehicles causing the greatest amount of highway damage.

2. Increase Vehicle Registration Fees

This could be accomplished by assessing different fees on vehicles, according to the vehicle's "book" value or gross vehicle weight. Compared to other states, Ohio's flat $20 registration fee is very low for automobiles with high book values. In addition to this, the inflation-adjusted level of registration revenue being collected from 80,000 lb. commercial cars (tractor-trailer units), and large farm trucks has decreased dramatically since 1951 (See Table 8).

One advantage of increasing the vehicle registration fee is that the majority of the increased revenue would go directly to the county and township highway departments. Under the current revenue distribution system, this appears to be the most direct way of alleviating the rural road and bridge funding deficit.

3. Increase Efforts to Enforce Vehicle Weight Restrictions

It is imperative that Ohio protect its road and bridge investment from the damaging effects of overweight vehicles. Information given earlier in this report indicated that current enforcement efforts have limited effectiveness. Two steps that could be taken to change this situation would be to increase the severity of the fines as well as increasing the number of portable scales in operation in the state. ODOT claims that portable scales have a citation rate in excess of 95 percent due to the fact that they are harder for the truckers to avoid.[11/]

4. Consider Increasing Registration Fees on Farm Trucks

Information presented in this report indicates that farmers are using heavier equipment and larger trucks than ever before.

These vehicles are used for the hauling of commodities to processors, elevators and terminal markets as well as for the transportation of inputs such as fuel and fertilizer from suppliers to the farms. Several county engineers in the leading grain-producing areas of the state were interviewed concerning this issue. Even though none of them were aware of any significant amount of damage being caused by semis on rural roads, because of the fact that many of Ohio's rural roads and bridges were not designed to accomodate loaded tractor-trailer units, the question arises as to how much damage farm vehicles are causing to these structures.

Farmers currently pay a truck registration fee that is lower than that paid by commercial truck owners. This would appear to be an economically equitable situation due to the fact that a farmer will typically use his truck less often than a commercial operator. This means that the commercial operator can spread out the fixed cost burden of the registration fee over many more miles. Even though the registration fee for farm trucks was raised in 1980, if further research should indicate that farmers are indeed causing an inordinate amount of stress on the rural highway system, they should be required to pay a higher registration fee in order to pay for the costs that they are causing.

5. Consider Road Abandonment

Much of today's rural road system was fashioned during the horse and wagon days when travel times were longer and farms were smaller. Some agricultural economist claim that with larg-

er farms and faster traveling times, many miles of rural roads could be eliminated. Not only would this decrease the strain on highway maintenance budgets, but it would also allow for the conversion of this valuable property back into productive acreage. Assuming a 33 foot right of way, farmland per square mile would be increased by 4 acres if rural roads were spaced two miles apart instead of one.[12/] At the present time, the legal implications of road abandonment would seem to make this alternative unrealistic at least in the short-term. More detailed analysis of the costs and benefits of road and bridge abandonment in Ohio is needed.

The Waterway User Charge and its Potential Impact on Ohio Grain Shipments - The Waterway Mode

Introduction

The implementation of a waterway user charge is a policy that has received an increased amount of attention over the past several years. This issue is of great significance to this country's agricultural sector due to the important role that water plays in the U.S. grain transportation system. In a survey of 1977 grain movements, barges moved 34.7 percent of the interstate shipments of corn, 24.4 percent of the wheat, and 45.7 percent of the soybeans. The importance of barges is even greater in export shipments where river movement accounted for 50.3 percent of the corn receipts at port areas, 29.1 percent of the wheat receipts, and 60.7 of the soybean receipts.[13/]

Waterway transportation is also a significant factor in the transportation of Ohio grain. This is readily evidenced by the fact that in 1980 there were 182 million bushels of grain shipped from Ohio ports on Lake Erie. In addition to this, there were 47 million bushels of grain shipped by barge from Cincinnati in that same year.

The purpose of the next section will be to discuss the potential impact of a waterway user charge on Ohio agriculture. The discussion will begin with a description of the structure of the U.S. inland waterway system as well as a presentation of the legisltative and historical activities that have been instrumental in the development of this transportation network.

The final section will present a brief review of the major economic research that has been conducted pertaining to the implementation of waterway user charges. This latter section will also include the various estimates that have been made regarding the effect that the user charge will have on the price paid to farmers in Ohio for their grain.

The U.S. Inland Waterway System

The U.S. inland waterway system, which includes the Mississippi River System, the Great Lakes, the Atlantic and Gulf Intracoastal Waterways, and the Pacific Coast Waterways, consists of 25,543 miles of navigable channels of varying depths.[14/] Ohio grain that is shipped via water travels by one of two methods. The first method is travel on the Great Lakes from Ohio's two grain shipping ports on Lake Erie: Toledo and Huron. Grain that is shipped from either of these ports is loaded onto a

"laker", a ship that is especially adapted for travel on the Great Lakes and has a capacity of approximately 25,000 tons, or a "salty", an oceangoing vessel that carries cargoes directly between Great Lakes ports and overseas ports. The majority of this grain is bound for foreign destinations such as Canada and Western Europe. The maximum allowable "draft"* on the Great Lakes and St. Lawrence Seaway channels is 27 feet.

The second method by which grain is shipped via water from Ohio is barges. Barges are large, rectangular vessels that can be tied together with several other barges to form a single integrated unit. This larger "unit" is then pushed by a towboat and the entire combination is called a tow. The principal large loading sites for grain in Ohio are at Portsmouth and the Cincinnati area. Each barge has a capacity of about 1,500 tons and the average number of barges in a grain tow moving on the Ohio River is six. The majority of this grain is transported to large export terminals at New Orleans or Baton Rouge. The maximum allowable draft on the Ohio River is nine feet.

Past and Present Legislation

In order for these large vessels to move on the inland waterway system, an enormous amount of physical improvements first needed to be made. Until recently, the policy of this country's Federal government has been to finance these improvements. This commitment by the Federal government dates back to the colonial

*"Draft" is the minimum water depth necessary to avoid grounding a vessel.

period.[15] At that time elected representatives recognized the importance of safe, navigable waterways to the economic development of the United States. Because of this, the Federal government assumed the responsibility for developing and maintaining this nation's river resources.[16] In 1824, Congress created the Corps of Engineers within the Department of the Army to plan, construct and maintain inland waterways. The original legislation stipulated that the navigable waterways be open to all wishing to use them without fees or taxes of any kind.

However, the economic environment in which the transportation industry operates today has changed significantly since the 19th century. Recognition of the changing transportation environment as well as a substantial increase in the amount of funds necessary to keep the inland waterway system operating properly led to executive branch proposals during the term of every President since 1940 to recommend that Congress adopt some form of user fee for the inland waterways.[17] Following a series of long debates, formal legislative action was taken with the passage of the Inland Waterway Revenue Act of 1978 (Title II of Public Law 95-502). With this law, Congress established waterway user fees in the form of a fuel tax on commercial traffic for partial recovery of costs of operation, maintenance and new construction on the inland waterway system.[18] The Act established a fuel tax of 4 cents per gallon beginning in October, 1980 and also specified incremental tax increases to 10 cents per gallon by 1985. These tax levels are expected to recover approximately 20-25 percent of allocated costs.[19] This tax was last revised in October,

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1981 to 6 cents per gallon. Assuming that the fuel efficiency of a tow consisting of 6 barges is 408 ton-miles per gallon, the current fuel tax has added approximately 0.5 cents per bushel to the cost of transporting grain from Cincinnati to Baton Rouge.

There are two additional pieces of legislation concerning waterway user charges currently being considered by the House of Representatives and the Senate. They are both similar in that they propose the recovery of 100% of the costs presently incurred by the U.S. Army Corps of Engineers for commercial navigation. The first proposal concerns the recovery of "deep-draft" navigation costs and has been entitled House Bill H.R. 5073 and Senate Bill S. 809. "Deep-draft" refers to those channels and ports of the United States that are of a federally authorized depth of fourteen feet or more. This includes the Great Lakes and the St. Lawrence Seaway. The second legislative proposal has been designated as House Bill H.R. 6078 and Senate Bill S. 810 and it pertains to "shallow-draft" navigation cost recovery. The latter proposal applies to both the Ohio and Mississippi Rivers. The remainder of this section will consider these two proposals separately.

Shallow-Draft Navigation Cost Recovery

The passage of a bill to impose a waterway user fee is a very sensitive political and economic task due to the potentially large sums of money to be gained or lost by shippers, carriers and

even consumers. The manner in which the user fee is implemented will be an important factor in determining which persons gain or lose those sums of money. There are two basic ways to go about levying a waterway user charge. One is to impose a uniform system-wide fee under which all traffic pays a tax at the same rate, regardless of the portion of the inland waterway system on which it travels. The alternative method is the segment-based tax under which traffic is charged a fee at a rate which reflects the government's cost of operating and maintaining the specific river segment on which that traffic is moving.[20/] The system-wide charge could possibly be implemented in the form of a fuel tax, a uniform ton-mile tax or a uniform license fee for towboats and/or barges. A segment-specific charge would likely be put in effect as a lockage fee, a ton-mile tax that varies by waterway segment, or a variable license fee for towboats and/or barges.

One of the most important considerations to be made when deciding upon a type of user-charge to be implemented is the economic ramification of that particular type of charge. For example, a system-wide fuel tax may not be economically equitable for all the users of the national waterway system. The reason for this is that some segments of the waterway system cost a considerably greater amount of funds to operate and maintain than others. With a uniform system-wide user fee, those persons that ship goods on the waterway segments that are cheaper to maintain are being forced to subsidize those persons that

ship goods on the relatively more expensive waterway segments. On the other hand, if a segment-specific user charge is enacted, there may be several waterway segments in the U.S. on which barge traffic will come to a virtual halt due to the expensive user fees.

Due to the interdependent structure of this country's national transportation system, the imposition of a waterway user charge may have any of several effects. The major items to be considered are: (1) Change in barge profits and rates, (2) Change in railroad profits and rates, (3) Shift in volume of goods moved by each competitive mode, and (4) Change in farm prices. As was mentioned previously, the objective of this report is to describe the effect that the waterway user charge will have on farm prices. A detailed discussion of the first items can be found in an earlier report that was completed as a part of this project. The titled of that report is "The Waterway User Charge and its Potential Impact on Ohio Grain Shipments," ESO 965, October 1, 1982.

Farm Prices

Some studies on this subject have assumed that all of the increased agricultural-related costs will immediately be passed directly to the farmer. In the short-run, however, most of the research tends to indicate that the barge operators and terminal elevator owners will absorb some of the costs by accepting lower margins. Nevertheless, in the long-run the consensus of the available information agrees that the farmer will bear the majority of the economic burden in the form of reduced grain prices.

The most extensive and complete research study concerning this matter was conducted by the U.S. Army Corps of Engineers, (COE), and was entitled, "Shallow-Draft Navigation Cost Recovery Analysis". This analysis was intended to specifically identify the impact of a waterway user charge such as the one proposed by Senate Bill S. 810 and House Bill H.R. 6078. The navigation costs subject to recovery are calculated in accordance with the formulas found in Amendment 1342 to S. 810 and they are intended to be large enough to allow for the recovery of 100% of the shallow-draft operation and maintenance expenditures of the Corps of Engineers. Table 9 summarizes the waterway user charges that are specified by this proposed legislation.

Table 10 presents the same information as Table 9 except that a segment-specific ton-mile fee has been employed. Because capital construction costs are not to be recovered until 1983, only operation and maintenance expenditures have been included in Tables 9 and 10. Because both of these tables have been calculated based on 1979 tonnages (post-diversion fiscal year 1983 tonnages have been projected to decrease by 3.6 percent),[21/] the amount of revenue collected will likely prove to be slightly exaggerated. Note that with a segment-specific ton-mile tax there is no surplus or deficit for each river segment..

As stated earlier in this report, in the long-run the majority of the added transportation expense will be paid by farmers in the form of lower grain prices. A uniform ton-mile fee of $.00150 equates into an added cost of 5.3 cents to transport a bushel of grain from Cincinnati to Baton Rouge. Ohio farmers

Table 9. Summary of Shallow-Draft Navigation Cost Recovery Fees for Selected Waterways as Specified in Amendment 1342 to S. 810. Based on a Uniform Ton-Mile Tax.

Waterway Segment	Average Operation & Maintenance Cost	1979 Ton-Miles	Uniform Ton-Mile fee	Segment Revenue	Surplus/ Deficit
	($1,000)	(1,000)		($1,000)	($1,000)
Upper Mississippi	51,756	26,966,792	$.00150	40,450	-11,306
Lower Mississippi	46,484	81,258,413	$.00150	121,888	75,404
Ohio River	28,966	43,415,819	$.00150	65,124	36,158

Source: U.S. Army Corps of Engineers, Shallow-Draft Navigation Cost Recovery Analysis

Table 10. Summary of Shallow-Draft Navigation Cost Recovery Fees Based on a Segment-Specific Ton-Mile Tax

Waterway Segment	Average Operation & Maintenance Cost	1979 Ton-Miles	Segment-Specific Ton-Mile Fee	Segment Revenue
	($1,000)	(1,000)		($1,000)
Upper Mississippi	51,756	26,966,792	$.00192	$51.756
Lower Mississippi	46,484	81,258,413	$.00057	$46,484
Ohio River	28,966	43,415,819	$.00067	$28,966

Source: U.S. Army Corps of Engineers, Shallow-Draft Navigation Cost Recovery Analysis

fare much better under the segment-specific ton-mile tax. In this case, a ton-mile fee of $.00067 for the Ohio River and $.00057 for the Lower Mississippi River results in a cost of 2.2 cents to transport a bushel of grain from Cincinnati to Baton Rouge.

Deep-Draft Navigation Cost Recovery

There has been a relatively small amount of research conducted pertaining to the effects of deep-draft navigation cost recovery. However, many of the same assumptions and considerations that have already been presented concerning shallow-draft navigation cost recovery are also significant to a discussion of deep-draft navigation cost recovery. The same types of waterway user fees that were presented earlier in this report can also be used for the recovery of deep-draft navigation costs.

The primary research that has been published concerning this subject was completed by the U.S. Army Corps of Engineers. This particular study was intended to evaluate the impact of a waterway user charge such as the one proposed by Senate Bill S. 809 and House Bill H.R. 5073. Some of the results of this research are presented in Table 11. The data for the COE report was collected and analyzed on a port-by-port basis. More specifically, a five year average of the annual navigation-related expenditures that have been required to keep each particular port operable were assessed to that port. This amount was then divided by the annual tonnage of cargo shipped out of each respective port in order to determine a recovery charge level in dollars per ton. The COE

Table 11. Summary of Deep-Draft Navigation Cost Recovery Estimates for Major Grain Shipping Ports on the Great Lakes

Port Area	Average Operation & Maintenance Cost	1978 Tonnage	Operation & Maintenance Cost Per Ton	Recovery Charge	Surplus/ Deficit
	($1,000)	($1,000)		($/Ton)	($1,000)
Duluth-Superior	$2,384	45,840	$ .052	$.052	$ 0
Chicago	1,020	1,563	$ .653	$.228	-$ 644
Milwaukee	1,391	4,495	$ .309	$.228	-$ 368
Saginaw	6,730	2,709	$2.485	$.228	-$6,114
Toledo	3,493	27,272	$ .128	$.128	$ 0
Huron	418	2,429	$ .172	$.172	$ 0

Source: U.S. Army Corps of Engineers, Deep-Draft Navigation Cost Recovery Analysis

study further assumed that the greatest user charge that can be placed on any one port area will be $.228 per ton.

The two ports from Table 11 that are of the most importance to Ohio agriculture are Toledo and Huron. As can be seen from this table, the estimated waterway user charge for Toledo is $.128 per ton and $.172 for Huron. This amounts to a charge of only 0.4 and 0.5 cents per bushel of grain shipped from each respective port area. This is a relatively small amount when it is compared to the estimated 2.2 to 5.3 cents per bushel that may be charged to grain being shipped from Cincinnati.

As with the analysis of the shallow-draft navigation cost recovery, the overall impact of a deep-draft waterway user charge will depend on the actions of the ship and railroad operators. If the railroads should choose to raise their rates to coincide with the increased shipping rates, then very little diversion of grain shipments from "lakers" to the railroads will occur. However, if the railroads maintain their rates at the same level, then some diversion of grain shipments will likely occur. The most advantageous of the two scenarios for the Ohio farmer would obviously be for the railroads to maintain their rates at the same level.

Conclusions

The overall impact of the implementation of a waterway user charge will be determined by several factors. First of all, the specifics of the legislation concerning waterway user charges that is approved by the House and the Senate will play a large part in determining the final outcome. The type of user fee that is im-

posed along with the level of recovery that is specified are two of the most inportant variables to be determined. The competitive actions and reactions of the railroads and the barge and "laker" operators will be essential in determining the levels of subsequent diversion in transportation mode as well as fixing the amount of the economic burden that is placed on farmers.

The results of a U.S. Army Corps of Engineers report indicate that a segment-specific user charge for the recovery of 100% of the navigation costs on the inland waterway system will add an additional 2.2 cents per bushel to the cost of transporting grain by barge from Cincinnati to Baton Rouge. The additional cost for this same shipment under a system-wide user charge is 5.3 cents per bushel. Furthermore, the Corps of Engineers indicates that a waterway user charge for the Ohio ports of Toledo and Huron will result in an additional cost of 0.4 and 0.5 cents per bushel of grain transported from each respective port area.

The results of most of the research concerning this subject indicate that the majority of the economic burden of a waterway user charge will be borne by the shipper in the long run. This means that the farmer will absorb the majority of the costs of this tax as it affects the shipment of agricultural inputs and products.

A Brief Summary of Ohio's Railway System - The Rail Mode

Introduction

The railway system in Ohio is a very important mode of transportation for the state's agricultural industry. Not only are large volumes of agricultural products shipped into and out of the state via railroads each year, but the intermodal competitive actions and reactions of the railroad industry are an important factor in determining the barge and trucking rates affecting the movement of these commodities.

This portion of the report will review the Ohio railroad network as it serves Ohio agriculture. A general description of the Ohio rail system will be followed by an analysis of the primary issues of concern to agricultural railroad users. Issues to be discussed include the Northeast Rail Service Act of 1981 and its effect on railroad abandonment, and the initial impacts of the Staggers Rail Act of 1980 in deregulating the railroad industry.

Ohio Rail System

With approximately 6,775 miles (as of 1980) of track in its system, the Ohio rail network has more track mileage per square mile than any other state in the nation. Of the 29 railroad companies operating in Ohio, ten are classified as Class I carriers (any carrier with annual total gross revenues of more than $50 million), 4 are Class II or Class III "line haul" carriers (total gross revenues of $10 million - $50 million and under $10 million, respectively), and 15 are switching terminal companies. However,

the four major Class I carriers (Conrail, Norfolk-Souther, CSX* and Detroit, Toledo and Ironton) operate over 91 percent of the track in Ohio.

Rail shipments of 12 different commodities represented 96 percent of the total rail tonnage originating and/or terminating in Ohio in 1978.[22/] Coal and metallic ores made up 54 percent of total rail tonnage for the top twelve commodities while rail tonnage for each of the remaining ten commodities averaged only 4.5 percent. Farm products comprised only 4 percent of major rail commodity movements.

The Ohio Rail Transportation Authority (ORTA) reports that in 1978 farm products generated an average of only 1.7 cents of revenue per ton mile. Coal and ore shipments are also low-revenus commodities, generating 2.6 and 3.3 cents per ton mile, respectively. High revenue items such as transportation equipment (9.2 cents per ton mile) and scrap (6.1 cents per ton mile) helped raise the average revenue for all 1978 Ohio rail shipments to 3.7 cents per ton mile.

ORTA points out that the variability in revenue density among commodities is especially significant for rail carriers operating branchlines that generate little or no next revenue. A carrier seeking ways to cut costs will closely evaluate the advantages and disadvantages of discontinuing branchline service for farm products and other low-revenue items. The ability of

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*CSX is the result of a 1980 merger between the Chessie System and the Family Lines Railway System.

the railroad industry to abandon branchlines and to change their rates was increased with the passage of two recent pieces of legislation. The next sections of this report will discuss these two Acts and their impact on Ohio agriculture.

Impact of the Staggers Act on Ohio Agriculture

In an attempt to improve the competitive capabilities of the railroad industry, the Staggers Rail Act of 1980 was signed into law by President Jimmy Carter on October 14. 1980.

Major items of consideration in the Staggers Rail Act of 1980 are as follows:[23/]

-Permits the railroads to change rates up or down within specified rail revenue to variable cost ratios provided 20 days notice be given for rate increases and 10 days for rate decreases.

-Railroads are permitted to increase rates quarterly to recover inflation-induced costs.

-Permits the railroads to make surcharges on traffic originating or terminating on certain light density rail lines.

-Legalized contracts between railroads and shippers.

-Sets a maximum time limit- 330 days after application- for rail abandonment proceedings. Criteria for abandonments wasn't changed.

-Limits ICC authority to issue car service orders to where it finds equipment shortages, traffic congestion, or other failures which have an adverse effect on rail service in the United States.

-Prohibits railroad companies from discussing, voting, or agreeing on single line rates or joint rates except with a rail carrier that forms a part of a particular single route.

Since the passage of the Staggers Act, railroad rates have become more volatile and complex. With increased rate-making

flexibility, railroads are better able to react to changing conditions in the transportation industry. For example, the current slowdown in the U.S. economy has resulted in declining industrial traffic and subsequent depressed truck and barge rates. Under the Staggers Act the railroads are better able to react to low barge and truck rates by lowering selected rates of their own. In the past, the time constraint of having to receive ICC approval for all rate changes hindered the abilities of railroads to react quickly to market conditions. Railroads were also reluctant to lower rates because they had no assurance rates could be raised once they had been lowered.

There appears to be some disagreement among agribusinessmen in the state as to what the actual impact of the Staggers Act has been. While some persons reported that rail rates affecting them had increased since 1980, others indicated that just the opposite was true. The complexity of the transportation industry also makes it difficult to determine the impact of legislation such as the Staggers Act. Several agribusinessmen have stated that they felt that any recent rail rate reductions have not been the result of deregulation, but rather the current large surplus of jumbo covered hopper cars. These hopper cars are used for the transportation of grain and fertilizer and the recent surplus has been blamed on an apparent over-production of these cars by the railroad industry as well as the reduction in demand caused by the sluggish economy.

The Northeast Rail Service Act of 1981

The Northeast Rail Service Act of 1981 (NRSA) is important to Ohio agriculture because of the impact it has on the economic functionings of Conrail. Under a previous bill, the 4R Act of 1976, Federal government subsidies to Conrail were to end as of October 1, 1981. Since the Federal government owns the controlling stock in Conrail, President Reagan had planned to order that this recently unprofitable railroad be split up and sold to private interests. Protests by Conrail supporters eventually led to a compromise in the form of the NRSA of 1981, which was signed into law on August 13, 1981. This bill had two major purposes. First of all, it gives Conrail two more years to become profitable. Secondly, it revised the rail abandonment procedures that Conrail must follow. Section 1156 of the Act includes the following provisions:

-Conrail is exempt from the ordinary abandonment procedures under the Staggers Act of 1980 which other railroads must follow.

-Conrail is granted the authority to abandon a line within 90 days after an application is filed unless, within such a 90-day period, an offer of financial support is made from an interested party.

-Interested parties are provided an opportunity to purchase at 75 percent of liquidation value, a line which has been approved for abandonment. The purchase offer must be made within a 120-day period following abandonment approval. Conrail must honor any such offer.

With the passage of the Staggers Act and the Northeast Rail Service Act of 1981, rail abandonment has been accelerated and

many country elevators, faced with a loss in rail service, have been forced to make adjustments. Impact analysis studies have been done on the effects of rail abandonment on shippers and communities which have lost rail service. Larson and Vogel found that the abandonment of 17 light density lines in central and western Ohio would have very little impact on aggregate grain transportation costs.[28/] Grain transportation costs were expected to increase by only $253,197.00 which is less than one-half of 1 percent of the total annual cost of moving grain produced in the 31 county area of the study. The alternative to abandonment was to upgrade and continue service with nearly $4 million in subsidies which the Ohio Department of Transportation Branch Line Plan estimated would have been needed for 1976 alone. Larson and Vogel's survey detected few, if any, examples of shippers which were "captive" to rail services, as few firms stated they would incur a substantial increase in transportation costs due to abandonment. In addition to this, John Foltz, Sr., the Executive Director of the Ohio Grain and Feed Association stated that he, "could think of no grain elevator closures caused exclusively by rail line abandonments, although it has been a contributing factor in some cases."

There have been numerous branchline abandonments in Ohio over the past five years and there are more expected in the near future. Due to the complexity and importance of this subject, this is an area of concern that should definitely receive continued attention in the future.

Not only have these two previously mentioned pieces of legislation revised the railroad abandonment procedures for the railroad industry, but they have also given the industry more freedom in setting rates and making tariff agreements. Some of the occurrences that have come about as a result of this will be discussed next.

Joint Rates and Switching Charges

In an attempt to gain more rail traffic and to utilize their inventory of rolling stock, some railroad companies have tried several different marketing strategies. The recent actions of Conrail are a good example of this. Conrail has cancelled all joint rates for shipments which switch from Conrail to another line or vice versa. A joint rate is a single rate a shipper pays for a commodity shipment which must utilize the services of more than one railroad company. Joint rates are usually lower than the sum of the point-to-point rates each railroad normally charges for traffic on a particular line segment. Conrail attempted to capture more customers by making it more expensive to switch to other railroads along a route. As a result, shippers using Conrail must either pay the higher cost of paying several rates for a single shipment or allow Conrail to route traffic along Conrail lines - a plan which inevitably calls for longer shipping times.

Another factor which has affected the cost of shipping grain is increased switching charges. While not directly related to the Staggers Act, the increase in switching charges has certainly

been encouraged by railroad deregulation. In the past two years the fee for switching traffic from one railroad to another has gone up from $90 per car to $177 per car. Switching charges have been increased to the point where the number of options available to a shipper could be substantially limited. Shippers fear that switching charges will go beyond the point of recovering costs and become retaliatory measures used by railroad companies against one another. This contingency would be harmful to both shippers and carriers alike.

Unit Train Operations in Ohio

The concept of transporting bulk commodities by unit train has gained widespread popularity in recent years. This is partly due to the fact that railroads have been given greater rate-making flexibility. This, along with the considerable energy and handling efficiencies gained in moving bulk items in unbroken 50-100 car "units" from one origin to one destination, has enabled the number of unit train grain loading facilities in Ohio to more than double since 1976. As of 1980, there were 35 unit train loading facilities in Ohio.

Another primary reason for the proliferation of unit train grain loading stations is the fact that increased diesel fuel prices have decreased the maximum distance a commodity can be shiped by truck before trucking costs become prohibitive. For example, in 1978 when the price of diesel fuel was approximately 40 cents per gallon, a grain shipper could afford to truck grain as far as 78 miles to a water port in Ohio before trucking costs

would become excessive. A shipper who was more than 78 miles away from a water port would have been better off delivering grain to a nearby rail shipper. In 1979, diesel fuel prices averaged 62 cents per gallon and the maximum trucking distance was reduced to 69 miles. An 86 cents per gallon average of diesel fuel in 1980 made it economical to truck grain only 61 miles before rail became the optimal mode of transportation. It is likely that the price of diesel fuel could increase to $2.00 per gallon by 1984. At this price the break-even distance would decrease further to 39 miles.

Several large grain firms indicated that they have plans to build more of these facilities in coming years. Even grain firms in the water port cities of Cincinnati and Toledo are using unit trains to increase capabilities to ship grain to many different markets. In Toledo the presence of unit train facilities is especially significant because grain firms there are no longer forced to store grain during the winter season when the Great Lakes system is impassable. At least one Toledo firm has plans to build unit train loading stations in southcentral and southeastern Michigan. According to the nature of the demand for grain, these trains could either transport grain to water facilities at Toledo or proceed to export facilities on the east coast.

The advent of the unit train has altered the role of the small country elevator in the Ohio grain marketing system. As mentioned previously in many areas the railroads consider branch-line service to small volume grain shippers to be uneconomical.

Until the 1980 Staggers Rail Act and the NRSA of 1981 was passed, railroads were forced by the Interstate Commerce Commission (ICC) to maintain almost all branchline service. Despite the fact that prior to this, railroads oftentimes deferred maintenance and allowed service to deteriorate to a point whereby many grain shippers had already voluntarily switched from rail to trucking, this legislation has increased the number of actual branchline abandonments. The future profitability of many of these country elevators will be determined to a larg degree by how well they adapt to the rapidly changing transportation environment.

Conclusion - A Time of Transition

The transportation industry has undergone tremendous change in the last decade, especially over the last several years with the advent of deregulation. How well the industry will adjust to these new forms of competition is yet to be seen. Increasing costs of energy will more strictly define the roles of trucking for short-distance hauls and rail and water movements for long-distance transport. The transitions now taking place in transportation are complex, challenging, and at times painful for shippers and carriers alike. Ohio agriculture can survive these transitions best by remaining flexible and innovative, ready to benefit from new opportunities in transportation.

This report was only intended to summarize the research that has been completed for the Rural Transportation Research Project.

For more specific information concerning the various topies mentioned in this report, the reader is asked to refer to the list of reports given on Page 2 of this report.

Footnotes

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5/ "Interstate Highway System," Ohio Department of Transportation, February 1981, p. 12.

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23/ Baumel, C. Phillip, Staggers' First Impact: Reduced Rates, Grain Journal, July 10, 1981.

24/ Donald W. Larson and Robert C. Vogel, "Railroad Abandonment: Optimal Solutions and Policy Outcomes." Chapter IV in Economic Regulation: Essays in Honor of James R. Nelson. William G. Shepherd and Kenneth D. Boyer (ed). East Lansing, Michigan State University Press, Forthcoming, 1981.